

Factors Affecting Dental Utilization and Dental Expenses in the Economically Active Population: Based on the 2010~2014 Korea Health Panel Data

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Background: The health of the economically active population contributes to increased corporate productivity by reducing the productivity loss caused by disease and increasing job efficiency, which in turn is a national benefit. Since the economically active population is a concept encompassing workers and a source of economic development for a country, that population's health should be treated with importance not only from a personal standpoint but also at a national level.

Methods: In this study, data of 11,007 adults aged 20 years and older who participate in economic activities were analyzed in the five-year Korea Health Panel Study from 2010 to 2014 including the number of dental visits and dental medical expenses.

Results: Factors related to "gender," "education level," "age," "duty category," "income level," "employment type," "national health insurance," and "chronic disease status" of the economically active population are affected in relation to the number of visits and dental medical expenses. The number of dental visits increased with higher education levels ($p < 0.001$), and the number of visits to the dentist increased with older age ($p < 0.001$). Dental medical expenses were 91,806 Korean won (KRW) more for "white-collar workers" than for "blue-collar workers" ($p < 0.03$), and 127,674 KRW more for "regular workers" than for "atypical workers" ($p < 0.02$).

Conclusion: When it is necessary to improve policies to enhance the efficiency of the distribution of health and medical resources in the overall balance of the dental health sector, we should try to identify various factors of oral health disorder due to income inequality among the classes according to the country's employment type in order to find ways to reduce the health gap among the social classes.

Key Words: Dental medical expenses, Dental visits, Economically active population, Employment type

Introduction

Health diminishes the loss of productivity that may be caused by absence due to a disease, while enhancing quality of life, thereby increasing overall professional efficiency^{1,2)}. This would contribute to boosting the productivity of enterprises and ultimately benefit the nation, and, thus, managing the health of the economically active population is a common goal among individuals, enterprises, and the government^{1,2)}. The "economically active population" refers to employed and unemployed individuals age 15 years or older³⁾. It is a concept that encompasses all workers and is the root of a nation's

economic growth. Hence, the health of the economically active population is an important issue not only for individuals but also for a nation⁴⁾.

Differences in employment conditions are key factors that increase the risk of disease in workers, as they affect health risk factors, such as physical, biological, and psychosocial environment, and behaviors beyond the differences in socioeconomic conditions⁵⁾. There is a gap in health states among workers according to work status whereby non-regular workers have poorer perceived health than regular workers⁶⁾, and multiple studies have also reported a gap in health states among workers according to type of occupation, whereby manual workers show a

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higher risk of disease and noncompliance with regular health check-ups than non-manual workers⁷⁾.

Oral health is intimately related to general health, and oral diseases and tooth decay have an adverse impact on quality of life functionally, psychologically, and socially. Therefore, preventing and managing oral diseases should be approached from the perspective of potentially not only improving oral but also general health^{8,9)}. However, people tend to perceive dental treatments as less urgent than medical treatments, and oral diseases are often neglected due to high treatment costs¹⁰⁾. As people age, the severity of oral diseases increases and treatment costs continuously multiply¹¹⁾. A prior study using the Medical Expenditure Panel Survey data reported that regular dental visits and dental treatment patterns differ according to race, type of health insurance, and income¹²⁾, and multiple studies in Korea pinpointed to financial burden and lack of time as the key reasons why workers fail to seek early dental treatment after developing an oral disease¹³⁾.

Although most workers are aware of the need for dental treatment, they cannot seek early treatment because they are not able to deviate from their workplace during work hours, and studies have reported that this varies according to job position¹⁴⁾.

In South Korea, the rate of non-covered services among many dental treatments is high, and the relatively low health insurance coverage is a significant problem¹⁰⁾. To increase the efficiency of health and medical resource allocation while ensuring equity in overall dental medicine, more studies on dental visits and dental costs, including non-covered service costs should be conducted¹⁵⁾. Furthermore, there are also few studies investigating the differences in dental visits and dental costs among the economically active population according to job position. Thus, this study aims to provide foundational data to rectify current policies so as to lower health inequity according to job position and type of occupation among the economically active population by conducting a longitudinal survey of the factors that affect the number of dental visits and dental costs among the economically active population using the 2010~2014 Korea Health Panel Survey (KHPS) data.

Materials and Methods

1. Participants and data

Data from the 2010~2014 (five years) KHPS were analyzed. The KHPS collects data from 90% of the 2005 comprehensive population and household survey in order to ensure representativeness of the study population¹⁶⁾. Because the survey is conducted using the same households every year, it is possible to observe the trends in people's number of dental visits and medical costs over the years and to compute the total dental expenses including non-covered service costs¹⁶⁾.

The number of dental visits and dental expenses was collected from the outpatient medical service data, and comprehensive data combining household member information, income of household members, and identification numbers for household members were used (HPID). On the basis of the HPID, there were 17,885 participants in 2010, 17,035 in 2011, 15,872 in 2012, 14,839 in 2013, and 13,973 in 2014. After excluding duplication we limited the age to 20 years or older according to our study purpose of examining the economically active population, resulting in a total of 11,007 individuals included in the analysis. Older adults aged 65 years or older were not excluded, as they are included among the employed and unemployed individuals aged 15 years or older according to the definition of economically active population in Statistics Korea data. However, data from only currently working old adults were included for the job position and type of occupation variables.

2. Study variables

The number of dental visits and dental expenses between 2010 and 2014 (five years) were set as the dependent variables. Gender, education level, age¹⁷⁾, duty category, income level, employment type, national health insurance, and chronic disease status were set as independent variables, all of which were converted to categorical variables (Table 1).

3. Analysis

The differences in the number of dental visits and dental

Table 1. Study Variable

Variable	Variable name	Description
Dependent variables	Number of dental visits	2010 ~ 2014 (for 5 years) total number of dental visits
	Dental medical expenses	2010 ~ 2014 (for 5 years) total dental medical expenses
Independent variables	Gender	1=man 2=woman
	Education level	1=less than elementary school graduation 2=less than high school graduation 3=more than a college graduate
	Age group (y) ^a	1=20 ~ 44 2=45 ~ 54 3=55 ~ 65 4=over 65
	Duty category	1=white-collar worker 2=blue-collar worker 3=unemployed person
	Income level	1=income level(1) 2=income level(2) 3=income level(3) 4=income level(4) 5=income level(5)
	Employment type	1=regular worker 2=atypical worker 3=not applicable
	National health insurance	1=employment-based insurance 2=local health insurance 3=medical care, etc.
	Chronic disease status	1=chronic disease 2=non-chronic disease

^aClassification according to the 2nd Korean Longitudinal Study of Aging Panel Survey in 2008¹⁷⁾.

expenses according to participants' general characteristics were compared with two independent-samples t-tests and a one-way ANOVA. The factors that affect the number of dental visits and dental costs were identified with linear regression analysis. Statistical significance was set at 0.05 for all statistical analyses, and STATA 11.0 (Stata Corp., College Station, TX, USA) software was used.

Results

1. Number of dental visits and dental costs according to general characteristics

The mean number of annual dental visits for five years was 4.5, and the mean dental expense was 458,151 Korean won (KRW). Regarding duty category, the number of dental visits was the lowest among blue-collar workers (3.59) and the highest among white-collar workers (4.77).

Regarding employment type, the number of dental visits for regular workers was 3.98, and that for atypical workers was 4.11. Dental expenses were the lowest for blue-collar workers (382,095 KRW) and the highest for white-collar workers (499,304 KRW). Regarding employment type, dental expenses were the highest for regular workers (504,558 KRW) and the lowest for atypical workers (397,521 KRW) (Table 2).

2. Factors that affect the number of dental visits and dental expenses

Table 3 shows the results of linear regression analysis with all study variables to identify the factors that affect the number of dental visits and dental expenses.

Education level, age, type of health insurance, and chronic disease status were found to affect the number of dental visits, while gender, age, duty category, income

Table 2. The Number of Visits to the Dentist and the Expenditure on Dental Care according to the General Characteristics of the Study

Variable	n (%)	Dental medical expenses (KRW)		No. of dental visits	
		Mean±SE	p-value	Mean±SE	p-value
Gender					
Man	4,733 (43.01)	441,895±18,474	0.232	4.51±0.12	0.861
Woman	6,271 (56.99)	470,421±15,351		4.53±0.10	
Education level					
≤Elementary school	2,741 (24.91)	505,632±26,985	0.001	4.94±0.16	< 0.001
≤High school	4,794 (43.57)	479,007±17,739		4.84±0.12	
≥University	3,469 (31.52)	391,813±18,661		3.74±0.12	
Age group (y)^a					
20 ~ 44	4,053 (36.83)	307,448±13,567	< 0.001	3.15±0.09	< 0.001
45 ~ 54	2,133 (19.38)	513,062±29,074		4.84±0.18	
55 ~ 64	2,033 (18.48)	666,316±36,612		6.15±0.21	
≥ 65	2,785 (25.31)	483,457±23,603		5.08±0.17	
Duty category					
White-collar worker	4,437 (40.32)	499,304±20,397	0.002	4.77±0.12	< 0.001
Blue-collar worker	1,945 (17.68)	382,095±25,503		3.59±0.14	
Unemployed person	4,622 (42.00)	450,652±17,099		4.68±0.12	
Income level					
Income level(1)	2,153 (19.57)	442,671±25,503	< 0.001	4.95±0.20	< 0.001
Income level(2)	2,224 (20.21)	377,296±23,677		3.89±0.15	
Income level(3)	2,219 (20.17)	370,558±22,761		3.96±0.15	
Income level(4)	2,242 (22.42)	535,857±28,790		4.99±0.18	
Income level(5)	2,166 (19.68)	565,863±30,429		4.84±0.17	
Employment type					
Regular worker	831 (7.59)	504,558±53,326	0.004	3.98±0.24	< 0.001
Atypical worker	3,151 (28.77)	397,521±19,321		4.11±0.13	
Not applicable	6,971 (63.64)	481,984±15,188		4.78±0.10	
National health insurance					
Employment-based insurance	7,090 (64.48)	491,928±15,180	< 0.001	4.60±0.09	0.318
Local health insurance	3,278 (29.81)	419,314±20,974		4.38±0.15	
Medical care, etc.	627 (5.70)	275,248±37,377		4.29±0.33	
Chronic disease status					
Chronic disease	7,309 (66.42)	505,609±15,425	< 0.001	5.10±0.10	< 0.001
Non chronic disease	3,695 (33.58)	364,276±17,444		3.38±0.11	

Data were determined by t-test or ANOVA analysis.

KRW: Korean won, SE: standard error.

^aClassification according to the 2nd Korean Longitudinal Study of Aging Panel Survey in 2008¹⁷⁾.

level, employment type, and type of health insurance were found to affect dental expenses.

The number of dental visits increased with an increase of both education level and age. Dental expenses were the highest among white-collar workers, 91,806 KRW higher than among blue-collar workers and 77,746 KRW higher than among the unemployed. Regarding employment type, dental expenses were 127,674 KRW higher among regular workers than among atypical workers.

Discussion

South Korea has seen a rise in the average national income with continuous economic growth, but the income inequity across social classes has been aggravated by a deepening gap according to socioeconomic conditions and employment type, as the atypical working population grew because of the implementation of policies promoting labor flexibility in response to the rising unemployment rate¹⁸⁾.

Table 3. Factors Affecting the Number of Dental Visits and Dental Medical Spending in the Study

Variable	Dental medical expenses (KRW)			No. of dental visits		
	Coefficient	SE	p-value	Coefficient	SE	p-value
Gender						
Man	Ref.			Ref.		
Woman	56,903	26,070	0.03	0.16	0.17	0.354
Education level						
≤Elementary school	Ref.			Ref.		
≤High school	61,561	35,197	0.08	0.90	0.23	<0.001
≥University	67,522	45,497	0.13	0.80	0.29	0.006
Age group (y)^a						
20~44	Ref.			Ref.		
45~54	188,741	35,549	<0.001	1.44	0.23	<0.001
55~64	330,351	41,400	<0.001	2.54	0.27	<0.001
≥65	200,037	46,420	<0.001	1.63	0.30	<0.001
Duty category						
White-collar worker	Ref.			Ref.		
Blue-collar worker	-91,806	41,248	0.03	-0.52	0.27	0.052
Unemployed person	-77,746	35,402	0.09	-0.16	0.23	0.496
Income level						
Income level(1)	Ref.			Ref.		
Income level(2)	-43,445	41,697	0.30	-0.46	0.27	0.084
Income level(3)	-50,525	42,440	0.23	-0.37	0.27	0.174
Income level(4)	97,012	42,715	0.02	0.49	0.28	0.077
Income level(5)	114,389	44,947	0.01	0.16	0.29	0.580
Employment type						
Regular worker	Ref.			Ref.		
Atypical job	-127,674	52,270	0.02	-0.19	0.34	0.573
Not applicable	-23,757	57,977	0.68	0.15	0.37	0.685
National health insurance						
Employment-based insurance	Ref.			Ref.		
Local health insurance	-85,894	27,722	<0.001	-0.36	0.18	0.046
Medical care, etc.	-232,528	55,459	<0.001	-0.93	0.36	0.009
Chronic disease status						
Chronic disease	Ref.			Ref.		
Non-chronic disease	-55,770	28,598	0.05	-0.93	0.18	<0.001
Constant	302,332	95,775	0.00	3.57	0.62	<0.001

Data were determined by linear regression analysis.

KRW: Korean won, SE: standard error, Ref.: reference.

^aClassification according to the 2nd Korean Longitudinal Study of Aging Panel Survey in 2008¹⁷⁾.

Such changes in the labor market have surfaced as serious social problems because they lead not only to wage differences between regular and atypical workers according to employment type and conditions, but also differences in welfare¹⁹⁾. Thus, this study aimed to investigate the factors that induce socioeconomic gaps, such as type of occupation and employment, as well as identifying factors that affect the number of dental visits and dental expenses in the economically active population.

Women visited dental offices about 0.1 times more than men did and also spent 56,903 KRW more than men did. This seems to support previous findings that women are more interested in oral health than men are²⁰⁾ and that they tend to avoid health-related risks more than men do²¹⁾. In terms of age, the number of dental visits in the 55~64 years group was about 2.5 times higher and 1.6 times higher than that of the 20~44 years group and 65 years or older group, respectively. Dental expenses were also

330,351 KRW higher in the 55~64 years group than among the 20~44 years group and 65 years or older group, respectively. These results are in line with previous study results that dental visits increase with advancing age²²⁾, and that dental utilization is higher among individuals age 50 years or older²³⁾. This may be because dental diseases are progressive diseases, and conditions that damage oral functions become chronic with advancing age, thereby increasing the need for treatment¹⁰⁾. Dental visits and dental expenses increased as education level and income increased, where the number of dental visits is about 0.1 times higher and dental expenses are 114,389 KRW higher in the fifth income quintile than in the first quintile. The fourth income quintile group also takes about 0.4 more dental visits and spends 97,012 KRW more than the first quintile group. Yeo and Jeong²⁴⁾ reported that oral health knowledge and interest as well as number of dental visits increase as income and education level increase. These results seem to reflect the reality in which a person's ability to pay for medical costs serves as an important factor in dental service utilization, as many dental treatments are non-covered services^{25,26)}. Regarding the type of health insurance, the number of dental visits was about 0.3 times and 0.9 times higher among those with employment-based insurance than among those with local health insurance and those receiving medical aid, respectively, and dental expenses were 85,894 KRW and 232,528 KRW higher, respectively. In particular, recipients of medical aid spent significantly less in dental expenses than the other two groups. According to a prior study, outpatient dental expenses rise with an increase of household living expenses, which is in line with a report that the narrow scope of dental coverage in Korea leads to high costs even for a single treatment and makes individuals' financial conditions an important factor affecting their dental service utilization¹⁵⁾.

Regarding duty categories, blue-collar workers visited dental offices about 0.5 times less and spent 91,806 KRW less on dental services than did white-collar workers. In terms of employment type, regular workers visited dental offices about 0.1 times more and spent 127,674 KRW more on dental services than did atypical workers. These

results were similar to previous findings that risk for poor health is higher among atypical workers than among regular workers, and that prevalence of dental caries and periodontal disease and oral health behaviors, such as tooth brushing, are higher among manual laborers, including agricultural and fishery workers and simple laborers, than among non-manual laborers, including managers, professionals, and relevant workers¹⁹⁾. Job position, which refers to type of employment, is one of the most widely used indices for determining socioeconomic position. It has been reported that atypical workers face higher psychological pressure and stress due to their unstable employment status than do regular workers^{27,28)}. Difficulty with adjusting to a new work environment due to short employment periods can hinder self-control, thereby easily inducing poor health behaviors, such as smoking, drinking, and excessive sugar intake, as opposed to promoting healthy behaviors^{27,28)}. Therefore, reducing employment anxiety by implementing policies that help workers maintain stable employment would be an effective measure both for stabilizing employment and reducing oral health inequity. Furthermore, occupation-related features, such as type of work and work environment, are highly associated with health. Previous studies reported that production workers are less educated than are office workers, that they often neglect to perform health behaviors due to lack of oral health knowledge, and that they fail to seek timely treatment because of the high treatment costs or lack of time available to seek treatment¹³⁾.

Yoon et al.²⁹⁾ reported that the standardized mortality ratio for suicide as well as total mortality from suicide were higher among agricultural and fishery workers. These results suggest that intensive labor beyond financial reward and material hardship induce poor mental and physical health, which may worsen oral health as well.

All in all, gender, education level, age, duty category, income level, and employment type were found to affect the number of dental visits and dental expenses in the economically active population. This study is meaningful in that unlike previous studies, it conducted a longitudinal analysis to identify the factors that affect the number of dental visits and dental expenses from the perspective of

duty category and employment type based on the 2010~2014 KHPS data. However, one limitation of this study is that we could not consider dietary habits and oral health behaviors, such as tooth brushing and use of oral care products, which may affect dental service utilization, because these were not included in the KHPS. Another limitation is that we could not perform separate subgroup analyses for more specific employment types and type of occupation because many participants were excluded for not having received any dental service in the study period, as dental treatments are generally less urgent because they are not generally life-or-death situations and many dental treatments are not covered and thus are costly. Nevertheless, one strength of this study is that we observed the trends of longitudinal dental service utilization over a five-year period, as opposed to previous cross-sectional studies that were largely focused on specific years. Furthermore, this study is meaningful in that it included non-covered service costs, which have not been examined in previous data.

Notes

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

This study was exempted from review by the Institutional Review Board at Hanyang University (IRB No. HYI-18-157-1).

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